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Friction coefficient obtained using AFM as a criterion of changes in the surface properties after low-temperature plasma treatment

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Technologies for materials joining require an increase in the contact and adhesion properties of their surfaces. There are different methods of these properties operation. The low-temperature plasma treatment is a perspective and ecological method. It allows you to change the properties of the surface layer to several nm without changing the volume characteristics of the material [1]. Frequently such a modification does not even lead to a change of the surface topography, determined by the high-resolution method of atomic force microscopy (AFM).

In this case the method of friction coefficient (Cfr) measurement using AFM in process of time is an effective way of the quantitative surface control. AFM NT-206 (Belarus) was used in this work. The method of Cfr measurement using AFM is based on the determination of angle of the probe arm twisting around its axis under the action of frictional forces between the surface and the probe [2].

The surface adhesion is exerted substantial influence on the value of Cfr. Adhesion increases after the exposure to plasma and according to it the console twisting and Cfr increases too. A two-layer polymer film PMF-351 was investigated. Cfr was measured within 70 minutes after exposure to plasma. It was found that during the first 35 minutes after the film treatment Cfr (Fig. 1) varies in the range from 0.015 to 0.025 and during the next 35 minutes it decreases according to a logarithmic dependence. The film surface in process of time loses its properties and returns to its original level. The determination of the time range at which the surface processed in the plasma retains its modified properties is an actual problem.

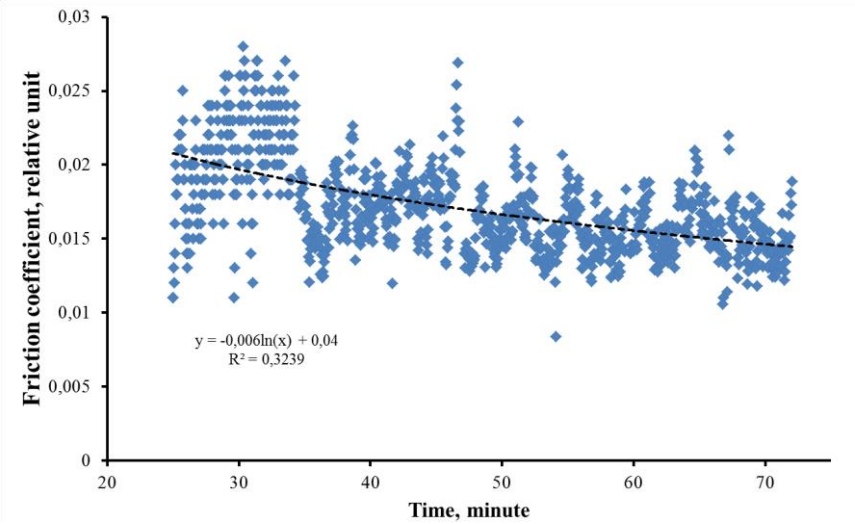

Figure 1. The change of friction coefficient a two-layer polymer film of PMF-351.

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